MWGG fieldtrip to Crummack Dale – Wednesday 21 August 2013

The geological history of the area is that Ordovician Rocks were laid down in deep waters when Britain was in the South Atlantic area 550my to 440my ago. These were folded and eroded before Silurian Rocks were deposited in a similar way from 440Ma to 400Ma.
There followed a major mountain building period as both the Ordovician and Silurian Rocks were folded during the late Silurian and Devonian (400 to 350my ago)
These rocks were then subject to major erosion which reduced them to sea level (Peneplanation)
Later in the Devonian the reactive tension forces of the earlier continental plate movements resulted in Faults in the base rocks which defined the Askrigg Block
At the start of the Carboniferous period (350Ma) when this area was again below sea level and in tropical latitudes firstly limestones with fringing reefs, then delta cycles followed by coal measures were laid down.
During this period the base tension faults developed further and resulted in large downward ground movements of the Craven Basin and Bowland Block. The vertical throw of the fault zone is up to 1,800 m (5,906 ft).
The Great Scar Limestone was over 200 metres thick and the overlying Yordale Series was over 300 metres thick before weathering to where we are today.
The elements we see on the walk are formed in three distinct period of Geological Eras
Ordovician – 500 – 440my ago Silurian - 440 – 400my ago and Carboniferous 350 – 270my ago
The Devonian is missing thus forming an unconformity of 50my around most of the Dale and 90my at Nappa Scar

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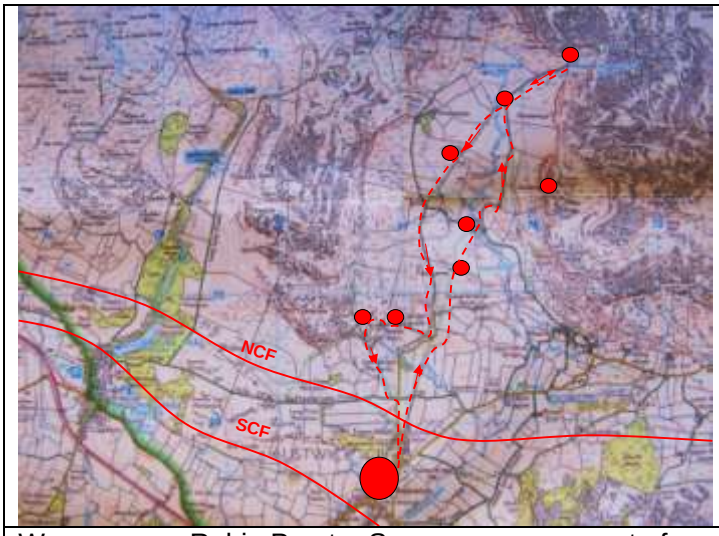
<td> 
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<td>The walk started outside the school at Austwick. The village lies between the North and South Craven Faults on an area of limestones of the Kilnsey, Cove and Gordale formations which – north of the fault – appear 250m higher on the hills around us.
During the walk we encounter Silurian and Ordovician rock formations exposed by glacial action with an unconformity to the limestones to the north, east and west.
The rocks to the north of the Craven Faults are in the Askrigg Block and to the south the Bowland Block and Craven Basin. Sadly the faults are not visible here but their effect takes us from highland to lowland. We set off north crossing the unseen North Craven Fault as we leave the village.</td>
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<td>We soon see Robin Procter Scar - an escarpment of Kilnsey, Cove and Gordale limestone series above us exposed by the North Craven Fault at its base in the mid Carboniferous 300Ma and Devensian Glacier 15k to 24k years ago. Although there have been hundreds of glacial periods since then only the effect of the most recent – 24ky to 15ky are in evidence now. The most obvious are the Norber Eratics we saw later on and Silurian syncline smoothed by the Devensian Glacier leaving striations on the surface indicating the direction of movement.</td>
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<td>We walked north until we see the outcrop of the south end of the Silurian Greywake syncline dipping steeply at 65 degrees to the north east. This is followed by a dip in the Dale which roughly follows the syncline until we see a further outcrop of the same rocks dipping to the south west. This was the north end of the syncline. Between the two is Wash Tubs with its ancient clapper bridge formed of large Ordivician slate slabs where we stopped for our lunch break. Soon we were on the old drover track towards Whetstone Spring</td>
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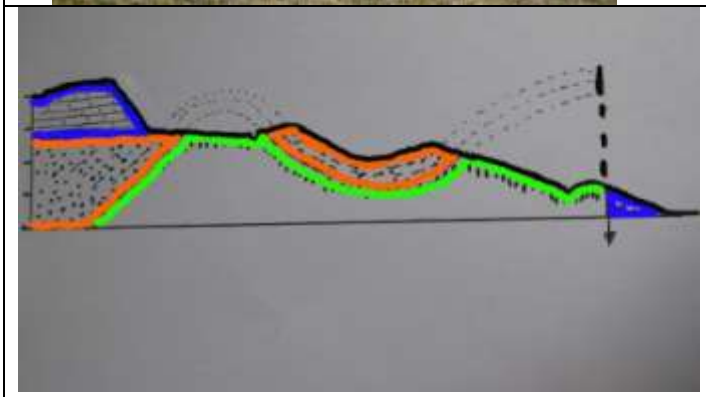
Our walk to Whetstone Spring takes us past the well known example of unconformity at Studrigg Scar (part of Moughton Scar) where the Silurian Sandstones/Siltstones of the Auswick Formation at the north end of the syncline are seen dipping at 65 degrees south west below the almost horizontal Carboniferous Cove Limestone – a gap of 50my of the Devonian Period when the Silurian rocks were eroded to a level plane. (Peneplanation)

We return to Nappa Scar with samples of the Moughton Whetstone in our pockets
noting the change in the wall construction as we head uphill from the track. The geology is changing as are the walls.
Nappa Scar has the same formation as Thornton Force with an unconformity of 90my between the Ordovician slates and the Carboniferous Limestones of the Kilnsey Formation. At the very base of the limestone is a thin layer of Conglomorate formed on a beach as the sea levels increased again after the Devonian.
The Breccia seen at footpath level is of angular slate in a matrix of Calcium Carbonate assessed to be from a landslide of an adjacent Ordovician cliff face being eroded at the start of the Carboniferous.

Next we saw the Norber Eratics which are hundreds of large Silurian Greywack Siltstone boulders of the Austwick Formation gouged out of the valley floor half a mile to the north and deposited on the Kilnsey and Cove Limestones by the Devensian Glacier. The Limestone around them has been dissolved away by rain after their deposition at a calculated rate of 25cms every 1000 years. The boulders are about 65my older than the rocks they sit on. This was an early problem for geologists who had not encountered the forces in glaciers.
We now return to Austwick



Section N-S from Moughton Scar to Austwick showing Carboniferous, Silurian and Ordovician Rocks, the unconformity and folding seen on the walk.

Moughton Whetstone Spring – some of the Mid Weekers group searching for good samples formed by *Liesegang* ring-type processes